CLAIMS

What is claimed is:

1. A method for forming a gate dielectric for an integrated circuit device, the method comprising:

forming an initial oxynitride layer upon a substrate material, said oxynitride layer having an initial physical thickness; and

subjecting said initial oxynitride layer to a plasma nitridation, said plasma nitridation resulting in final oxynitride layer, said final oxynitride layer having a final physical thickness.

2. The method of claim 1, wherein said final physical thickness exceeds said initial thickness by less than 5 angstroms.

3. The method of claim 1, wherein said final physical thickness is less than 20 angstroms.

4. The method of claim 1, wherein said final oxynitride layer has an equivalent oxide thickness of less than 15 angstroms.

5. The method of claim 1, wherein said final oxynitride layer has a nitrogen concentration of at least $2.0 \times 10^{15}$ atoms/cm$^2$.

6. The method of claim 1, wherein said initial oxynitride layer is formed upon said substrate by:

ionically implanting nitrogen atoms into said substrate; and

oxidizing said substrate, following said substrate being ionically implanted with nitrogen atoms.

7. The method of claim 1, wherein said initial oxynitride layer is formed upon said substrate by rapid thermal nitric oxide (NO) deposition.

8. The method of claim 6, wherein said final oxynitride layer further has a reduction in effective electron mobility, $\mu_{eff}$, of less than 20% from the effective electron mobility of said initial oxynitride layer.

9. A gate dielectric for an integrated circuit device, the gate dielectric comprising:

an oxynitride layer formed upon a substrate;

said oxynitride layer having a film thickness of less than 20 angstroms; and

said oxynitride layer further having a nitrogen concentration of at least $2.0 \times 10^{15}$ atoms/cm$^2$.

10. The gate dielectric of claim 9, wherein said oxynitride layer further has an equivalent oxide thickness of less than 15 angstroms.

11. The gate dielectric of claim 9, wherein said oxynitride layer further comprises:

an initial oxynitride layer formed by rapid thermal nitric oxide (NO) deposition upon a substrate material; and

a final oxynitride layer, said final oxynitride layer formed from said initial oxynitride layer by subjecting said initial oxynitride layer to a plasma nitridation.

12. The gate dielectric of claim 9, wherein said oxynitride layer further comprises:

an initial oxynitride layer formed by oxidizing a substrate material which has been implanted with nitrogen atoms; and

a final oxynitride layer, said final oxynitride layer formed from said initial oxynitride layer by subjecting said initial oxynitride layer to a plasma nitridation.

13. The gate dielectric of claim 12, wherein said final oxynitride layer further has a reduction in effective electron mobility, $\mu_{eff}$, of less than 20% from the effective electron mobility of said initial oxynitride layer.